may have been increased. Construction of the gastric tubes varied between the two groups, with additional staplings in the thoracic group. This additional gastric resection resulted in smaller gastric remnants in the thoracic group. Equivalent anastomotic techniques were not used in the chest and neck. The occurrence of anastomotic complications, types of complications, and associated morbidity were not addressed.

The pH measurements may be inaccurate if the pH probe was positioned with endoscopic verification during only the initial measurement. Since esophageal pH measurements in the cervical group were obtained at a mean of 3.6 cm closer to the neo-gastroesophageal junction than in those with thoracic anastomoses, imprecision in pH probe placement at later study times could account both for the large variability in pH measurements and the perceived increase in acid exposure over time.

Although Johansson and associates imply that cervical anastomoses are inferior to thoracic anastomoses, their results do not support this conclusion. The wide confidence intervals of the groups overlap in all variables assessed; statistically, the groups are equivalent. The statistical analysis demonstrates only that the patterns of reflux are different. It does not directly demonstrate a difference in pharyngeal acid exposure between the groups. In addition, the trend was toward fewer anastomotic strictures, fewer dilations, and decreased occurrence and severity of esophagitis in the patients undergoing a cervical anastomosis. At 1 year, none of the patients with a cervical anastomosis had these problems. Symptomatic complaints were also less common in the cervical group at 1 year.

The data of Johansson and associates suggest comparable or superior results after cervical anastomosis. Combined with previously documented advantages of cervical anastomosis (minimal mortality with anastomotic leak, avoidance of thoracotomy with transhiatal approach), these results support cervical anastomosis during esophageal reconstruction as the preferred method for restoration of esophagogastric continuity.

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REFERENCE

1. Johansson J, Johnsson F, Groshen S, Walther B. Pharyngeal reflux after gastric pull-up esophagectomy with neck and chest anastomoses. *J Thorac Cardiovasc Surg* 1999;118:1078-83.

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Reply to the Editor:

We appreciate the interest expressed by Temes and his colleagues in our article about neck and chest anastomoses after

gastric pull-up esophagectomy. The question whether the anastomoses should be performed in the neck or chest is indeed an important issue—perhaps one of the most important to elucidate.

This study addresses the question whether anastomoses in the apex of the right side of the chest or in the neck differ in terms of pharyngeal reflux measured by serial pH studies in the same patients during the first postoperative year. All patients, whether they were operated on for palliation or for cure, had a standardized approach that included laparotomy, right posterolateral thoracotomy, and, for patients with neck anastomoses, a neck exploration. The gastric tube, tailored to approximately 5 cm in diameter, was prepared in the same way for neck and chest anastomoses and never included pyloroplasty. The only difference between the two reconstructions was that the tube was 3.6 cm longer in patients with neck anastomoses than in those with chest anastomoses. All chest anastomoses were performed with a circular stapling device in the apex of the right side of the chest, and all neck anastomoses were hand sutured in a standardized way. The high failure rate of attempted stapled anastomoses in the neck in the only randomized study¹ so far addressing the subject of neck or chest anastomoses, along with the fact that cervical anastomoses can easily be performed manually in a highly standardized way, made us choose this technique for the anastomoses in the neck. Furthermore, we wanted to resect as much of the thoracic esophagus as possible in patients with anastomoses in the chest. For this reason, we used the circular stapling device with a detachable head for these anastomoses. In fact, the detachable head is a prerequisite for an esophagogastric anastomosis when there are only a couple of centimeters of free esophagus at the apex of the chest. This and the fact that most surgeons prefer to staple high thoracic anastomoses² became decisive for us concerning the type of thoracic anastomoses to perform in the study.

Postoperatively, no clinically or radiologically detected anastomotic leaks were found. For patients with neck anastomoses, the median age was 72 years (range 53-80 years) and the median hospital stay 14 days (8-68 days). Two patients had tumors in the proximal esophagus, 8 in the middle, and 10 patients in the distal esophagus. Three patients had tumor stage I, 6 had stage II, and 11 had stage III-IV. The median age of patients with chest anastomoses was 64 years (range 53-82 years, $P = .146$) and the median hospital stay 14 days (8-68 days, $P = .639$). Nine patients had tumors in the middle esophagus and 18 in the distal esophagus. One patient had tumor stage I, 5 had stage II, and 21 patients had stage III-IV. None of the studied patients had any malignant anastomotic recurrence or any pyloric stricture at follow-up. Three months after the operation, benign and endoscopically dilated strictures were equally distributed between neck and chest anastomoses, but no such lesions were detected later than 3 months except in one patient with a chest anastomosis, in whom a stricture was identified at 12 months.

Irrespective of anastomotic site, both the proximal and the distal pH probes were placed in relation to the cricopharyngeal muscle, which in turn was determined by esophageal manom-

etry. The two pH probes were individually positioned in all patients, but always at the same levels during the three serial measurements. For proper statistical testing with analysis of variance, data must be normally distributed. This was obtained by a logarithmic transformation, and the results of the statistical analyses were retransformed to the original scale of measurement and were graphically depicted in the article. At the 3-month follow-up study, acid exposure to the pH probe *distal* to the cricopharyngeal muscle was not higher in neck anastomoses than in chest anastomoses. This was true although a couple more centimeters of the esophagus were sacrificed in the neck anastomoses, and subsequently the acid-producing gastric tube was closer to the distally placed pH probe. Acid exposure to the two pH probes placed in the distal esophageal remnant and in the pharynx increased from the 3-month controls to the 6- and 12-month controls only in the patients with neck anastomoses. The pattern of increased acid exposure in the neck anastomotic group but not in the chest anastomotic group may be explained by a less optimal clearance from the remaining esophagus. This in turn may be due to the healing process in this area or to the dissection of the neck esophagus with injuries to branches from the recurrent laryngeal nerve innervating the cricopharyngeal muscle, a drawback of this approach that recently has been described.³

We strongly disagree with Temes and his colleagues that the procedures were "atypical and variable" and that "the study design is flawed." The difference between acid exposure to anastomoses in the neck and in the upper part of the chest is statistically proved, but to what extent these findings also are clinically significant in terms of increased long-term pulmonary problems remains to be determined.

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REFERENCES

1. Chasseray VM, Kiroff GK, Buard JL, Launois B. Cervical or thoracic anastomosis for esophagectomy for carcinoma. *Surg Gynecol Obstet* 1989;169:55-62.
2. Urschel JD. Esophagogastrostomy anastomotic leaks complicating esophagectomy: a review. *Am J Surg* 1995;169:634-40.
3. Hulscher JBF, van Sandick JW, van Devriese PP, Lanschot JJB, Obertop H. Vocal cord paralysis after subtotal oesophagectomy. *Br J Surg* 1999;86:1583-7.

12/8/106036
doi:10.1067/mtc.2000.106036